Modeling Guidance **5** **Final**	# Antidegradation and the Wasteload Allocation Process	
	Rule reference: OAC rule 3745-1-05; OAC Chapter 3745-2	Revision 0, March 17, 1999

The purpose of this document is to educate the reader on the application of the antidegradation rule (OAC rule 3745-1-05) in the wasteload allocation process. Wasteload allocation rules are contained in OAC Chapter 3745-2. It is assumed that the reader is familiar with OAC Chapter 3745-2 and related guidance documents. This document does not provide an exhaustive review of either the antidegradation or wasteload allocation rules. It merely provides guidance in those areas where the two rules intersect. This document is divided into the following sections:

Section 5.1 of this document contains guidance on how OAC Chapter 3745-2 provides methods to implement OAC rule 3745-1-05 in the following areas:

A) when D.O. modeling is not necessary
B) calculating average permit limits from maximum permit limits
C) calculating 95th percentile effluent quality.

Section 5.2 explains how to implement OAC rule 3745-1-05 in the wasteload allocation process. Illustrations of valid methods of calculations are provided.

5.1 Methods to Implement OAC Rule 3745-1-05

5.1.1 Dissolved Oxygen Modeling

Antidegradation applies to all regulated pollutants; however, there are several cases when D.O. modeling is typically not required to be conducted.

A) The first step in calculating a wasteload allocation for nonconservative substances is to determine the effluent NH_3-N required to maintain the criteria for NH_3-N toxicity. If a very stringent effluent NH_3-N is required to maintain the criteria for NH_3-N toxicity, it may not be necessary to conduct a dissolved oxygen simulation. The level of NH_3-N removal required will be the limiting factor in the allocation by dictating the need for advanced treatment.

B) Shallow streams with high slopes will usually have high rates of reaeration. In these streams, instream D.O. levels will typically be elevated and NH_3-N toxicity (as in A above) will likely be a limiting factor.

C) If there is not sufficient site-specific stream data (for example, velocity and depth) available to conduct D.O. modeling, it may be necessary to conduct the allocation for NH_3-N toxicity and to base the effluent CBOD on available information concerning treatment processes.

The topic of when D.O. modeling is required is also discussed in Water Quality Standards Guidance #1, “Set asides to limit lower water quality.”

5.1.2 Conversion to Average Permit Limits

OAC rule 3745-1-05(B)(1)(a)(iii)(a) - Conversion of a maximum permit limit to an average concentration value. If it is necessary to derive an average concentration value from a maximum permit limit, the following relationship can be used for the conversion:

Average = 0.73 * maximum

This factor is specified in Guidance #1, “Calculating PEQ: determining a discharger’s effluent quality” as the relationship between maximum Projected Effluent Quality (PEQ) and average PEQ.

5.1.3 Calculation of Ninety-fifth Percentile

OAC rule 3745-1-05(B)(1)(c)(I) - Calculation of a ninety-fifth percentile. It may be necessary to calculate a ninety-fifth percentile effluent quality for a new source already in existence. This effluent quality may be calculated using the method detailed in Guidance #1, “Calculating PEQ: determining a discharger’s effluent quality”. Other methods may be used if they meet the requirements of OAC rule 3745-2-04(D)(2) and (3).

5.2 Implementation of OAC Rule 3745-1-05 in the Wasteload Allocation Process

5.2.1 Outstanding High Quality Waters

OAC rule 3745-1-05(C)(5)(a) - Outstanding high quality waters. The antidegradation rule allows an increase in effluent concentration only as a result of flow conservation, and restricts the increase in instream concentration to a maximum of 5%. In order to determine the increase in instream concentration that would result from flow conservation, it is necessary to determine the projected instream quality before and after flow conservation.

The following equation from OAC rule 3745-2-05(A) is used to calculate the projected ambient water quality:

$$\text{Instream} = \frac{Q_{EFF}(WQ_{EFF}) + Q_{UP}(WQ_{UP})}{Q_{EFF} + Q_{UP}}$$

where:

Q_{EFF} = effluent design flow
WQ_{EFF} = effluent quality
Q_{UP} = stream design flow
WQ_{UP} = background water quality

Antidegradation addresses only average effluent limits; therefore, as specified in OAC rule 3745-2-05(A)(1), 7Q10 is used as the stream design flow in the above equation. 30Q10 is used as the stream design flow for NH_3-N. 100% of the stream design flow should be used in these calculations.

Projected ambient water quality is first determined using the existing average permit limit as WQ_{EFF} and the existing permit flow as Q_{EFF} in the above equation. Projected ambient water quality is then determined using the effluent quality and flow (as WQ_{EFF} and Q_{EFF}, respectively) that would result from the implementation of water conservation at the facility. The percent change in instream water quality can then be calculated.

Example:

The following information is assumed:

Effluent data:
Existing average permit limit = 50. ug/l
Effluent design flow = 1.0 cfs
After water conservation, the design flow will reduce to 0.75 cfs.

Upstream data:
Upstream 7Q10 = 5.0 cfs
Upstream WQ = 0.1 ug/l

Step 1 - Determine the existing permit load.

*50. ug/l * 1.0 cfs * CF = 0.122 kg/d*
NOTE: CF = conversion factor of 0.0024467

Step 2 - Determine the projected instream concentration with the facility discharging at the existing permit limit and flow.

$$\frac{5.0 \text{ cfs } (0.1 \text{ ug/l}) + 1.0 \text{ cfs } (50. \text{ ug/l})}{6.0 \text{ cfs}} = 8.4 \text{ ug/l}$$

Step 3 - Determine the effluent concentration at the reduced effluent flow.

0.122 kg/d / 0.75 cfs / CF = 66.5 ug/l

Step 4 - Determine projected instream concentration with the facility discharging at the effluent flow and quality after the implementation of water conservation.

$$\frac{5.0 \text{ cfs } (0.1 \text{ ug/l}) + 0.75 \text{ cfs } (66.5 \text{ ug/l})}{5.75 \text{ cfs}} = 8.76 \text{ ug/l}$$

Step 5 - Determine the change in projected instream quality. The projected instream concentration increased from 8.4 to 8.76 ug/l, which is 4.3%. Therefore, this could be allowed since the increase was less than 5%, which is the maximum increase allowed by rule.

5.2.2 Set Aside for State Resource Waters and Superior High Quality Waters (other than Lake Erie)

As provided for in OAC rule 3745-1-05(C)(7)(b) and (d), for State Resource Waters and Superior High Quality Waters (other than Lake Erie), a portion of the remaining available pollutant assimilative capacity will be reserved at the time the water is designated. Therefore, any determination of allowable effluent loads must consider this reserve. The following example will address the expansion of a WWTP to a Superior High Quality Water, will use NH_3-N as the parameter for the analysis, and will determine the maximum allowable load increase that will not exceed the reserved portion of the remaining available pollutant assimilative capacity.

Example:

The following information is assumed:
Assume that a WWTP is proposing to expand from 2.0 to 3.0 cfs and that 50% of the remaining available pollutant assimilative capacity was reserved in a past action.

Effluent Data:
Existing design flow = 2.0 cfs
Existing permit limit for NH_3-N = 2.0 mg/l
Expanded effluent flow = 3.0 cfs

Upstream Data:
Upstream 30Q10 = 5.2 cfs
Upstream NH_3-N = 0.05 mg/l

Downstream Data:
WQS for NH_3-N = 1.1 mg/l

Step 1 - Determine the WLA to maintain water quality criteria for NH_3-N toxicity at the expanded WWTP design flow of 3.0 cfs.

$$\frac{1.1(5.2 + 3.0) - 5.2(0.05)}{3.0\ \text{cfs}} = 2.92\ \text{mg/l}$$

Step 2 - Determine the remaining available pollutant assimilative capacity with the WWTP discharging at its existing design flow and existing permit limit.

downstream flow under 30Q10 conditions = 5.2 + 3.0 = 8.2 cfs
*Waterbody Pollutant Assimilative Capacity = 8.2 cfs * 1.1 mg/l * CF = 22.069 kg/d*
*Background Pollutant Load = 5.2 cfs * 0.05 mg/l * CF = 0.636 kg/d*
*Current Permit Load = 2.0 cfs * 2.0 mg/l * CF = 9.787 kg/d*

Remaining Available Pollutant Assimilative Capacity =

22.069 kg/d	*Waterbody Pollutant Assimilative Capacity*
0.636 kg/d	*Background Pollutant Load*
9.787 kg/d	*Current Permit Load*

11.646 kg/d	*Remaining Available Pollutant Assimilative Capacity*

Step 3 - Determine the reserved portion of the remaining available pollutant assimilative capacity. 50% of the remaining available pollutant assimilative capacity was reserved.

*0.5 * 11.646 = 5.823 kg/d reserved*

Step 4 - Determine the available load for the expansion. 5.823 kg/d was reserved; therefore, there is still 5.823 kg/d available for the expansion.

Step 5 - Determine the possible effluent load after the expansion. The WWTP could increase their discharge by 5.823 kg/d.

5.823 + 9.787 (existing permit load) = 15.61 kg/d

At the expanded design flow of 3.0 cfs, the WWTP could increase their discharge to 15.61 kg/d and not exceed the reserved portion of the remaining available pollutant assimilative capacity. A discharge of 15.61 kg/d at an effluent flow of 3.0 cfs would result in an effluent NH_3-N of 2.1 mg/l.

Step 6 - Consider Best Available Demonstrated Control Technology (BADCT). Any new flow must be treated to a level no less restrictive than Best Available Demonstrated Control Technology (BADCT). The result of mixing the current design flow at the existing permit limit with the additional flow at BADCT is:

$$\frac{2.0\,(2.0) + 1.0(1.0)}{3.0} = 1.7 \text{ mg/l } NH_3\text{-N}$$

The BADCT mix NH_3-N of 1.7 mg/l is more restrictive than the 2.1 mg/l determined above, which is the maximum discharge level that will not exceed the reserved portion of the remaining available pollutant assimilative capacity. Therefore, the WWTP could not discharge more than 1.7 mg/l NH_3-N at the expanded design flow of 3.0 cfs.

5.2.3 Set Asides for CBOD

The issue of determining a set-aside for CBOD is complex because there is no water quality criterion for CBOD. Instead, CBOD is important as a water quality parameter because of its impact on instream dissolved oxygen levels. In addition, NH_3-N also exerts a demand on instream D.O. levels. Dissolved oxygen water quality models are used to predict the impact of effluent CBOD and NH_3-N on instream D.O.

As provided for in OAC rule 3745-1-05(C)(7)(b) and (d), for State Resource Waters and Superior High Quality Waters (other than Lake Erie), a portion of the remaining available pollutant assimilative capacity will be reserved. Therefore, any determination of allowable effluent loads must consider this reserve. The following example will address the expansion of a WWTP to a Superior High Quality Water, and will determine the maximum allowable load increase that will not exceed the reserved portion of the remaining available pollutant assimilative capacity for NH_3-N and CBOD. Since there is no water quality criteria for CBOD, D.O. modeling must be used to determine assimilative capacity for CBOD. However, as discussed in Water Quality Standard Guidance 1 (Set asides to limit lower water quality), set asides for D.O. should be based on an NH_3-N toxicity analysis, except in limited circumstances. The following example will assume that a calibrated and verified dissolved oxygen model is available, and that the use of this model is necessary to improve the decision making by the Agency.

Example

Assume that a WWTP is proposing to expand from 2.0 to 3.0 cfs, and currently has summer *permit limits of 33.0 mg/l $CBOD_5$, 2.0 mg/l NH_3-N, and 5.0 mg/l D.O. For this example, assume that 50% of the remaining available pollutant assimilative capacity has been reserved. The following data will be used in the example:*

Upstream Data:
30Q10 = 5.2 cfs
7Q10 = 4.0 cfs
NH_3-N = 0.05 mg/l

Downstream Data:
stream use designation = Warmwater Habitat
pH = 8.0 S.U.
Temperature = 23.0 ^oC
WQS for NH_3-N = 1.1 mg/l

Step 1 - Determine if the current permit limits are adequate to maintain the water quality criteria for NH_3-N toxicity at the existing WWTP design flow.

$$\text{WLA for } NH_3\text{-N} = \frac{1.1(5.2 + 2.0) - (5.2 * 0.05)}{2.0} = 3.8 \text{ mg/l } NH_3\text{-N}$$

The current permit limit of 2.0 mg/l is more restrictive than the WLA of 3.8 mg/ and is adequate to maintain water quality criteria for NH_3-N toxicity at the existing WWTP design flow.

Step 2 - Use the calibrated and verified D.O. model to assess the impact of the current permit flow and load on instream D.O. The model results showed a predicted minimum D.O. of 5.36 mg/l downstream of the WWTP. Therefore, the existing permit limits are adequate to maintain the WQS for D.O. at the existing design flow under summer 7Q10 conditions.

Step 3 - Determine the WLA to maintain water quality criteria for NH_3-N toxicity at the expanded WWTP design flow of 3.0 cfs. As mentioned previously, 50% of the remaining pollutant assimilative capacity is reserved.

> *downstream flow under 30Q10 = 5.2 + 3.0 = 8.2 cfs*
> *Waterbody Pollutant Assimilative Capacity = 8.2 cfs * 1.1 mg/l * CF = 22.069 kg/d*
> *Background Pollutant Load = 5.2 cfs * 0.05 mg/l * CF = 0.636 kg/d*
> *Current Permit Load = 2.0 cfs * 2.0 mg/l * CF = 9.787 kg/d*
>
> *Remaining Available Pollutant Assimilative Capacity =*
> *22.069 kg/d   Waterbody Pollutant Assimilative Capacity*
> *0.636 kg/d   Background Pollutant Load*
> *9.787 kg/d   Current Permit Load*
> *---------------*
> *11.646 kg/d   Remaining Available Pollutant Assimilative Capacity*

*50% of the remaining available pollutant assimilative capacity, or 5.823 kg/d (0.5 * 11.646), is reserved; therefore, there is still 5.823 kg/d available for the expansion. The WWTP could increase their discharge by 5.823 kg/d, for a total effluent load of 15.61 kg/d (9.787 + 5.823) and not exceed the reserved portion of the remaining available pollutant assimilative capacity. A discharge of 15.61 kg/d at an effluent flow of 3.0 cfs would result in an effluent NH_3-N of 2.1 mg/l.*

Step 4 - Apply BADCT for NH_3-N to the additional flow. Any new flow must be treated to a level no less restrictive than Best Available Demonstrated Control Technology (BADCT). The result of mixing the current design flow at the existing permit limit with the additional flow at BADCT is:

$$\frac{2.0\,(2.0) + 1.0(1.0)}{3.0} = 1.7 \text{ mg/l } NH_3\text{-N}$$

The BADCT mix NH_3-N of 1.7 mg/l is more restrictive than the 2.1 mg/l determined above, which is the maximum discharge level that will not exceed the reserved portion of the remaining available pollutant assimilative capacity. Therefore, the WWTP could not discharge more than 1.7 mg/l NH_3-N at the expanded design flow of 3.0 cfs.

Step 5 - Evaluate BADCT for CBOD and D.O. The next step in the analysis is to calculate the BADCT mix level for CBOD, and to determine if the BADCT mix is more restrictive than the allowable CBOD level that considers the reserved portion of the remaining available pollutant assimilative capacity. The result of mixing the current design flow at the existing permit limit with the additional flow at BADCT is:

$$\frac{2.0\,(33.0) + 1.0(23.0)}{3.0} = 30.0 \text{ mg/l } CBOD_{20}$$

Effluent D.O. must also be determined using the BADCT mix calculation. The result is:

$$\frac{2.0\,(5.0) + 1.0(6.0)}{3.0} = 5.3 \text{ mg/l D.O.}$$

Step 6 - Determine the assimilative capacity for CBOD. In order to determine the reserved load for CBOD, the total assimilative capacity with the WWTP discharging at 3.0 cfs under summer 7Q10 conditions must be determined. The D.O. model will be used to determine the allocation to maintain the WQS for D.O., and therefore, the waterbody pollutant assimilative capacity for CBOD.

From the model output, it can be determined that the waterbody pollutant assimilative capacity for $CBOD_{20}$ is 13.56 mg/l under these summer design conditions.

Step 7 - Determine remaining available pollutant assimilative capacity. The allowable loads can be determined as follows:

downstream flow under 7Q10 conditions = 4.0 + 3.0 = 7.0 cfs
*Waterbody Pollutant Assimilative Capacity = 7.0 cfs * 13.56 mg/l * CF = 232.24 kg/d*
*Background Pollutant Load = 4.0 cfs * 2.0 mg/l * CF = 19.57 kg/d*
*Current Permit Load = 2.0 cfs * 33.0 mg/l * CF = 161.48 kg/d*

Remaining Available Pollutant Assimilative Capacity =

232.24 kg/d	*Waterbody Pollutant Assimilative Capacity*
19.57 kg/d	*Background Pollutant Load*
161.48 kg/d	*Current Permit Load*

51.19 kg/d	*Remaining Available Pollutant Assimilative Capacity*

*Step 8 - Determine the additional load that is available for the expansion. 50% of the remaining available pollutant assimilative capacity, or 25.60 kg/d (0.5 * 51.19), is reserved. Therefore, an additional 25.60 kg/d of $CBOD_{20}$ is available for the expansion.*

161.48 kg/d	*Current Permit Load*
25.60 kg/d	*available for expansion*

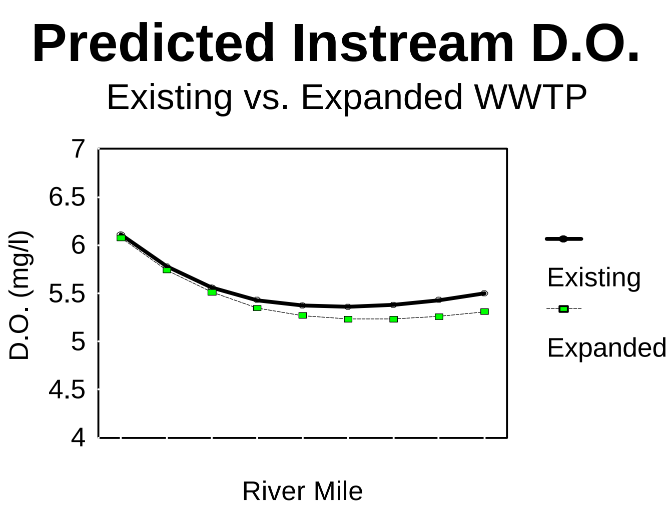
187.08 kg/d	*Possible permit load after expansion*

Conclusion
A load of 187.08 kg/d $CBOD_{20}$ results in an effluent quality of 25.5 mg/l $CBOD_{20}$ at 3.0 cfs. This is more restrictive than the BADCT mix level of 30.0 mg/l $CBOD_{20}$. Therefore, the possible effluent limits for the expansion, pending the results of the antidegradation review are:

25.6 mg/l $CBOD_{20}$, 1.7 mg/l NH_3-N, 5.3 mg/l D.O.

The following figure compares the predicted instream D.O. levels with the WWTP discharging under summer 7Q10 conditions at:

1) existing flow of 2.0 cfs and existing permit limits
2) expanded flow of 3.0 cfs and the limits for the expansion noted above



5.2.4 Exclusions

5.2.4.1 OAC Rule 3745-1-05(D)(1)(b)(I) - exclusion for a General High Quality Water. This section of the antidegradation rule details the load increases that qualify for an exclusion. The average wasteload allocation (WLA) is determined as specified in OAC rule 3745-2-05. The 10% and 80% levels specified in the antidegradation rule are then determined as 10% and 80%, respectively, of the average WLA for that facility. It should be noted that for a proposed discharge, it will not be necessary to assess the 80% level since receiving 10% of the allocation can not result in exceeding 80% of the allocation. Two examples follow. The first addresses a proposed discharge to a General High Quality Water, while the second addresses an expansion to a General High Quality Water.

Example:

The following information is assumed:

Proposed WWTP flow = 1.0 cfs
Average WLA to maintain WQS = 50. ug/l

Step 1 - Using the wasteload allocation results, determine the allowable load to maintain WQS.

*50. ug/l * 1.0 cfs * CF = 0.122 kg/d*

Step 2 - Determine the deminimis level of 10% of the average WLA

*0.1 * 0.122 = 0.012 kg/d*

In this case, the discharger can receive a load of up to 0.012 kg/d (10% of the WLA) without going through a complete antidegradation review. The discharger can receive a larger load, up to the WLA of 0.122 kg/d; however, a complete antidegradation review would be required.

In the case of a proposed discharge of sanitary wastewater, the discharge must be treated to a level no less stringent than Best Available Demonstrated Control Technology (BADCT). Therefore, if BADCT is more stringent than the level required to maintain water quality criteria, the BADCT level must be compared to the 10% and 80% levels to determine if a BADCT discharge would require a complete antidegradation review.

Example

The following information is assumed:

Existing WWTP design flow = 0.5 cfs
Existing average permit = 30. ug/l
WWTP proposes to expand to 1.0 cfs
Average WLA @ expanded flow of 1.0 cfs = 50. ug/l

Step 1 - Using the wasteload allocation results, determine the allowable load to maintain WQS.

*50. ug/l * 1.0 cfs * CF = 0.122 kg/d*

Step 2 - Determine the deminimis level of 10% of the average WLA

*0.1 * 0.122 = 0.012 kg/d*

Step 3 - Determine the level of 80% of the WLA.

*0.8 * 0.122 kg/d = 0.098 kg/d*

Step 4 - Determine the current permit load.

*0.5 cfs * 30. ug/l * CF = 0.037 kg/d*

Step 5 - Determine the possible increase in effluent load.

0.037 (existing permit load) + 0.012 (10% of WLA) = 0.049 kg/d

This value (0.049 kg/d) is less than the 80% level of 0.098 kg/d; therefore, the discharger can receive an increase of up to 0.012 kg/d (10% of WLA), as long as the total load is less than 0.098 kg/d (80% of the WLA), without going through a complete antidegradation review. A larger increase, or an increase that results in a total effluent load that exceeds 80% of the WLA, may be allowed; however, a complete antidegradation review would be required.

In the case of a proposed expansion for the discharge of sanitary wastewater, OAC rule 3745-1-05 requires that the new additional flow must be treated to a level no less stringent than Best Available Demonstrated Control Technology (BADCT). A mix of the existing permit limits and existing design flow with the new additional flow at BADCT is determined (referred to as "BADCT mix"). Therefore, if the BADCT mix is more stringent than the level required to maintain water quality criteria, the BADCT mix level must be compared to the 10% and 80% levels to determine if the BADCT mix discharge would require a complete antidegradation review

<u>5.2.4.2 OAC Rule 3745-1-05(D)(1)(b)(ii) - exclusion for Superior High Quality Waters (other than Lake Erie)</u>. At the time that a water is designated as Superior High Quality, a portion of the remaining available pollutant assimilative capacity is reserved. A net increase that results in less than a 5% change in ambient water quality does not require a complete antidegradation review, provided the proposed lowering of water quality does not exceed the reserved portion of the remaining available pollutant assimilative capacity. A larger increase may be allowed with a complete antidegradation review; however, in no case can the proposed lowering of water quality exceed the reserved portion of the remaining available pollutant assimilative capacity.

Example:

The following information is assumed:

This example assumes 40% of the remaining available pollutant assimilative capacity is reserved.
The WWTP wants to expand from 2.32 cfs to 4.64 cfs.

Use the following data in the example:

upstream 7Q10 = 9.23 cfs
upstream WQ = 25. ug/l
existing average permit limit = 1500. ug/l
chronic criteria = 600. ug/l

Step 1 - Calculate instream concentration with WWTP at existing design flow and existing permit limit.

$$\frac{9.23(25.) + 2.32(1500)}{11.55} = 321.\ \text{ug/l instream}$$

Step 2 - Calculate water body pollutant assimilative capacity with WWTP at the expanded design flow of 4.64 cfs.

*(9.23 + 4.64 cfs) * 600. ug/l * CF = 20.361 kg/d*

Step 3 - Calculate Background Load.

*9.23 cfs * 25. ug/l * CF = 0.565 kg/d*

Step 4 - Calculate Existing Permit Load.

*2.32 cfs * 1500. ug/l * CF = 8.515 kg/d*

Step 5 - Calculate Remaining Available Pollutant Assimilative Capacity.

20.361 kg/d (Water Body Pollutant Assimilative Capacity at expanded design flow)
- 0.565 kg/d (Background Load)
- <u>8.515</u> kg/d (Existing Permit Load)
11.281 kg/d (Remaining Available Pollutant Assimilative Capacity)

Step 6 - Calculate reserved portion of remaining available pollutant assimilative capacity (40% is reserved).

*0.4 * 11.281 = 4.512 kg/d is reserved.*

Step 7 - Calculate the highest load that the facility can discharge and not exceed the reserved portion of the remaining available pollutant assimilative capacity.

20.361 kg/d (Water Body Pollutant Assimilative Capacity)
- 0.565 kg/d (Background Load)
- <u>4.512</u> kg/d (Reserved)
15.284 kg/d (Remaining Available Assimilative Capacity)

The facility currently has a permitted load of 8.515 kg/d; therefore, the facility could increase their load by 6.769 kg/d to a total effluent load of 15.284 kg/d. Any increase in effluent load that results in a change in the instream water quality of greater than 5% requires a complete antidegradation review. What load causes a 5% change in the instream water quality?

From Step 1 above, the instream water quality with the facility discharging at its current permitted flow and load = 321. ug/l.

Step 8 - Calculate a 5% increase in instream water quality.

*321. ug/l * 1.05 = 337. ug/l*

Step 9 - Calculate the discharge quality at the expanded design flow of 4.64 cfs that will result in a predicted instream water quality of 337. ug/l (5% increase).

$$\frac{337.(9.23 + 4.64) - 9.23(25.)}{4.64} = 958.\ \mathrm{ug/l}$$

*958. ug/l * 4.64 cfs * CF = 10.876 kg/d*

Conclusion:
The facility, at the expanded design flow of 4.64 cfs, can discharge a total load of up to 10.876 kg/d, without going through a complete antidegradation review. This would be an increase of up to 2.361 kg/d above the current permit load of 8.515 kg/d, would cause less than a 5% change in the projected ambient water quality, and would not exceed the reserved portion of the remaining available pollutant assimilative capacity. With a complete antidegradation review, the facility could possibly discharge up to 15.284 kg/d (an increase of up to 6.769 kg/d). This level of discharge would result in greater than a 5% change in the projected ambient water quality, but would not exceed the reserved portion of the remaining available pollutant assimilative capacity.

<u>5.2.4.3 OAC Rule 3745-1-05(D)(1)(b)(iii) - Exclusions for direct discharges to Lake Erie</u>. The average WLA is determined as specified in Rule 3745-2-05 of the Administrative Code. This value is then converted to a load using the effluent design flow. The 10% level specified in the antidegradation rule is then determined as 10% of the average WLA, which has been converted to load.

Example:

The following information is assumed:

The facility would like to increase their average permitted load.

Use the following data in this example:

existing average permit limit = 40.0 ug/l
effluent design flow = 3.0 cfs
background concentration = 0.25 ug/l
chronic criteria = 5.0 ug/l

Step 1 - Calculate Water Body Pollutant Assimilative Capacity.

*(11 * 5.0 ug/)l -(10 * 0.25 ug/l) * 3.0 cfs * CF = 0.385 kg/d*

Step 2 - Calculate 10% of Water Body Pollutant Assimilative Capacity

*0.10 * 0.385 = 0.039 kg/d*

Step 3 - Calculate current permit load

*3.0 cfs * 40.0 ug/l * CF = 0.294 kg/d*

Conclusion:
The facility can receive an increase in their permitted load of up to 0.039 kg/d, for a total load of 0.333 kg/d (0.294 kg/d + 0.039 kg/d = 0.333 kg/d), without going through a complete

antidegradation review. A larger increase would require a complete antidegradation review.

5.2.4.4 OAC Rule 3745-1-05(D)(1)(b)(iv) - Exclusions for State Resource Waters. The following equation from OAC rule 3745-2-05(A) is used to calculate the projected ambient water quality:

$$\text{Instream} = \frac{Q_{EFF}(WQ_{EFF}) + Q_{UP}(WQ_{UP})}{Q_{EFF} + Q_{UP}}$$

where:

Q_{EFF} = effluent design flow
WQ_{EFF} = effluent quality
Q_{UP} = stream design flow
WQ_{UP} = background water quality

Antidegradation addresses only average effluent limits; therefore, as specified in OAC rule 3745-2-05(A)(1), 7Q10 is used as the design flow in the above equation. 30Q10 is used as the stream design flow for NH_3-N. 100% of the stream design flow should be used in these calculations.

Projected ambient water quality is first determined using the existing average permit limit as WQ_{EFF} in the above equation. Projected ambient water quality is then determined using the limit requested by the discharger as WQ_{EFF} in the above equation. The percent change as detailed in the antidegradation rule is then determined.

The five mile criterion listed in the antidegradation rule shall be interpreted on a case by case basis. The upstream/downstream delineation should account for features such as tributary confluences or other major point sources.

5.2.5 Downstream Classifications

In the wasteload allocation process, the OAC rules require that downstream use designations be considered. For example, assume a WWTP discharges to RM 0.2 of an unnamed tributary that is designated as a Limited Resource Water. The unnamed tributary joins a stream that is designated as Exceptional Warmwater Habitat. Therefore, the WLA must be calculated to maintain the LRW criteria in the unnamed tributary and the EWH criteria in the next stream.

Analyses for antidegradation must also consider downstream classifications. Using the situation in the preceding paragraph, assume that the unnamed tributary is a General High Quality Water, and that the next stream is a State Resource Water. Both paragraphs (D)(1)(b)(I) and (D)(1)(b)(iv) of OAC rule 3745-1-05 must be applied in the evaluation of whether or not an exclusion applies.

As in the determination of effluent limits to maintain water quality criteria, depending on the distance to the next stream in the network, time of travel, parameter being evaluated, etc., it may not be necessary to consider the downstream classification.

Cross Reference

Water Quality Standards Guidance #1 - Set asides to limit lower water quality.

Modeling Guidance #1 - Calculating PEQ: determining a discharger’s effluent quality.

For more information contact:

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